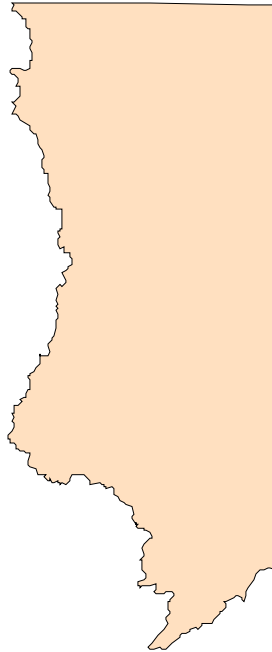


PART IV-RICH COUNTY ANNEX RISK ASSESSMENT



GENERAL BACKGROUND INFORMATION

Rich County, located in the northeast corner of Utah occupies a land area of 1,034 square miles, extending from Wyoming on the east and Idaho on the north, with the southern portion of the Bear Lake extending into the County.

In 1863, members of the Church of Jesus Christ of Latter-day Saints (Mormons), under the leadership of Apostle Charles C. Rich, settled the northern portion of Bear Lake Valley in what is now Bear Lake County, Idaho. A year later, settlers began establishing themselves in the southern part of the valley in the vicinity of present day Meadowville, Utah (an unincorporated area), and at several other locations in Round Valley. The move into the southern Bear Lake Valley brought the settlers into conflict with Chief Washakie and his band of Shoshoni, who had historically used the area as an annual gathering place. Ongoing conflicts with these Native Americans continued until 1872 at which time Washakie and his people relocated to the Wind River reservation in Wyoming. Mormon settlers then freely expanded their settlements from Bear Lake Valley into neighboring Bear River Valley, establishing the site of Randolph in 1870, and Woodruff in 1871. In 1872 the federal government completed its survey of the area and established the exact location of the forty-second parallel, separating Idaho and Utah. After 1872 the Rich County seat was moved from Paris, (Idaho) to Randolph, Utah.

Rich County is comprised of two separate geographical regions: Bear Lake Valley and Bear River Valley. Nearly forty miles separate the communities of Woodruff and Garden City. The geographic isolation of the two valleys and the difficulty of travel between communities in each, resulted in the somewhat separate development of each. Randolph and Woodruff developed more similarities with the Wyoming communities within Bear River Valley than they did with the Bear Lake communities of Garden City and Laketown. Laketown and Garden City, had more in common with the Idaho communities of the Bear Lake Valley.

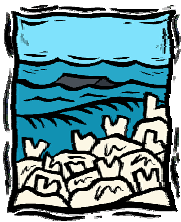
Most of Rich County is highland, but is well known for its lowlands which support productive farms and livestock. Of its 659,840 square miles, less than one acre in ten is devoted to crop production. Grazing on the other hand occupies one half of the County's acreage. Livestock and livestock products account for eighty percent of the County's income. There are also about 243 farms in Rich County which average 2,162 acres in size. Wild hay, alfalfa, barley and oats are the principle farm crops. Garden City, located within the County is known for its raspberries, with a raspberry festival held every August attracting hundreds of tourists throughout the region.

Rich County is also known for its recreation spots including the Wasatch National Forest, Bear Lake State Park, and Rendezvous Beach State Park. Bear Lake, once called the Sea of Silence, invites vacationers of all types to its beaches. In the summer, water skiing, sailing, swimming, fishing, and camping are popular activities, and in the winter months, snowmobiling, tubing, and ice fishing are popular.

Rich County has none of the industrial, educational or cultural assets of Box Elder or Cache Counties. Bear Lake has carried this sparsely populated county's economy for some time. This economic picture is rounded out by a number of cattle ranches and agricultural farms which make up the other half of the picture. Generally speaking, this area survives based on its service

community associated with summer and winter recreational seasons. A definite lack of diversity in its economy has led Rich County to a relatively flat growth rate, which in recent years has actually been negative. The recreational potential is still strong and the recreation needs of increasing numbers of Wasatch Front residents and Cache Valley residents will provide increased demand for the recreational assets found in Rich County. The County is also subject to dramatic seasonal population shifts due to "Snow birds", and an under-utilized winter season. (See the "Population Density and "Land Ownership" map in the map section of the county annex).

Table IV-48: Rich County Participating PDM Jurisdictions			
Rich County	Garden City	Laketown	Woodruff



RICH COUNTY FLOODING

Background

The flood risk for Rich County is minimal. The county is sparsely populated and the communities are generally not located near a flood source. The Bear River passes through Rich County in an area with some agricultural use. It flows primarily through rural areas with little or no development.

All of the four incorporated cities in Rich County have small streams that pass through the communities. These communities have historically experienced minimal impacts from flooding.

The southern half of Bear Lake is located in Rich County. A great deal of beach front development has occurred along the shores of Bear Lake. The rising lake level has rarely threatened lakeshore development but some flood of homes has occurred. Pacificorp operates a hydroelectric facility on the lake and has purchased some of the flood prone lakeshore properties to mitigate the impact of high lake level flooding.

History of Flooding in Rich County

Table IV-49: Rich County Flood History 1847-2003		
Location	Date	Description
Randolph	1955	Flooding caused the closure of the Highway.
	Spring 1983	Damage to roads, culverts & bridges. Some homes flooded and crop damage.
Woodruff	Spring 1983	Damage to roads, culverts & bridges. Some homes flooded and crop damage.
Local Surveys (see appendix A) (Butler & Marsell, 1972), (Division of Comprehensive Emergency Management, 1981)		

Rich County Flood Hazard Assessment Hazard Profile

Frequency	Infrequent
Severity	Moderate
Location	Generally along rivers, streams and canals.
Seasonal Pattern	Spring flooding as a result of snowmelt. Mid-late summer cloudburst events.
Duration	A few hours or up to three weeks for snowmelt flooding
Speed of Onset	1-6 hours
Probability of Future Occurrences	Moderate-for delineated flood plains there is a 1% chance of flooding in any given year.

In Rich County, only Woodruff Town has a delineated flood plain. An August 2003 report Flood Hazard Identification Study: Bear River Association of Governments by the U.S. Army Corps of Engineers was used to determine flood risk for communities that do not have FEMA Firm flood plain maps (See Appendix B for full report).

In **Unincorporated Rich County** what development does exist near the Bear River (isolated farmsteads) has potential flood risk and to some extent development around Bear Lake.

Portions of **Garden City** have some risk of flooding from the Garden City Canyon drainage and to a lesser extent the smaller drainages to the south and north.

Randolph City has some flood threat from the Little Creek drainage. The upstream Little Creek Reservoir may help moderate this risk.

Woodruff City has flood risk from the Genes Creek and Dry Creek drainages.

Assessing Vulnerability: Identifying Assets & Estimating Losses

Very minimal property is at risk of flooding in Rich County. Even agricultural impacts are minimal when the Bear River flood because most the adjacent use is grazing land that can adapt to higher flows. With the exception of Woodruff Town, the lack of flood plain data makes it very difficult to pinpoint potential specific impact areas. However, based on local experience the potential impacts are negligible.

Woodruff Town is the only Rich County community that has a flood plain map. Base on GIS overlay analysis, approximately nineteen housing units or fifty persons are located in the 100 year flood plain. It is estimated that \$1,425,397 in residential property is at risk.

Assessing Vulnerability: Analyzing Development Trends

Most of the growth in terms of new development is occurring in Garden City and to a lesser extent Laketown. Most of this new development is second home housing associated with the Bear Lake recreation area. A great deal of this development is on the hillsides above Garden City proper. Some risk of flooding is possible as this development encroaches on drainages.

New development on the Lakeshore could also increase the property at risk. However this risk is somewhat minimal.



RICH COUNTY WILDFIRES

Background

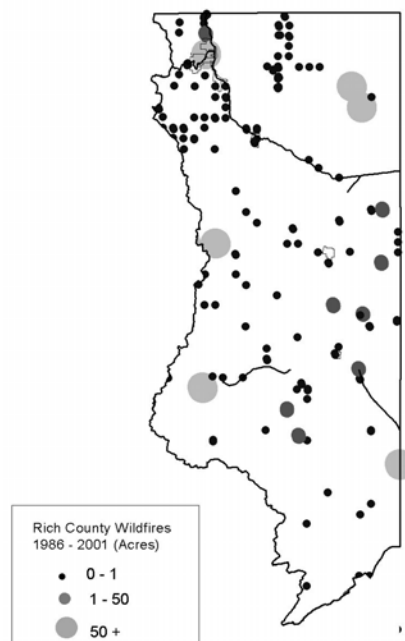
Wildfires occur with some frequency in Rich County. The vast majority occur in areas that are predominately sage and scrub vegetation on BLM owned land. Most fires rarely threaten human safety or property and are often allowed to burn. The primary conflict area in terms of threat to property as it related to wildfire are areas above Garden City town proper, in mostly secondary home developments associated with the Bear Lake Recreation area. Some of these homes are built in heavily timbered areas.

Portions of the Cache National Forest are located in western Rich County. Transitioning down slope from the forest into the Bear Lake Valley and Garden City a significant number of cabins are located in Garden City above the traditional town center. Some of these homes are built in heavy vegetation and timber. Many are surrounded by lower sage type vegetation.

These areas are at risk from wildfire originating in the Forest Service managed land to the west and also human caused fire through or below the development. Much of this development is bisected by U.S 89 as it makes its rather steep decent into Garden City from Cache County. Sparks caused by overheating brakes on heavy trucks have been known to start fires adjacent to the road. In the right conditions, these types of fires can quickly spread to portions of the Bridgerland development and others. **See the “Wildfire Hazard” Map in the county annex map section.**

History of Wildfires in Rich County

The following graphic illustrates the number and rough locations of wild fires in Rich County in the 15 year period from 1986 to 2001.



Rich County Wildfire Hazard Assessment Hazard Profile

Frequency	Annually (to some extent)
Severity	Moderate
Location	Dispersed throughout the whole county
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-6 hours
Probability of Future Occurrences	High (Based on data from 1986-2001, there is a 24% chance a fire of at least 1000 acres will occur every year)

Located in **Garden City** above the historic town core are a number of mostly secondary homes located in areas at some risk from wildfire. Most of the developed land is characterized by rather steep slopes with limited access and inadequate water supplies. Most homes do not have defensible space around them. Many of these homes are built with flammable building materials and do not adhere to “firewise” construction techniques.

Adequate fire response is a problem for these areas. Garden City maintains an all volunteer fire department. Heavy tanker trucks would only be able to crawl up the steep road grade of U.S. 89 to respond to a fire. Although only a few miles away, response times for some areas can be over 30 minutes in drive time alone.

Representing one of the largest developments, the Bridgerland Village property owners have formed a community fire planning team and developed a community fire plan.

Assessing Vulnerability: Identifying Assets & Estimating Losses

Table IV-50: Rich County Wildfire Risk Residential and Commercial					
Jurisdiction Name	Population	Residential Development at Risk		Commercial Development at Risk (x 1000)	
		Units	Value	Units	Income*/Structures**
Garden City (Bridgerland Village)	331 Mostly Part Time	102 Cabins	\$15,500,000		
Population and Residential Development estimates are derived using 2000 Census data					
*2002 estimated total sales revenue (Census)					
** Based on average 2002 assessed commercial building value for Cache County (2002 State Tax Commission Report & Cache County Assessor’s Office)					
Note: Communities not listed have no residential or commercial property identified in the hazard.					

Assessing Vulnerability: Analyzing Development Trends

The secondary recreational home market is predicted to remain strong for areas around Bear Lake (Garden City & Laketown). New problems will occur as more homes are built in fire prone areas. Many parcels are currently subdivided and for sale in high fire risk areas.

A rather large second home development (100+ lots) is working its way through Rich County planning approval about 12 miles west of Woodruff town on the Monte Cristo road (Hwy 39). It's likely the county will require the provision of fire equipment on-site and trained emergency response personnel.



RICH COUNTY LANDSLIDES

Background

The potential for impacts related to landslides is minimal in Rich County. See the “Landslide Potential” Map in the county annex map section.

History of Landslides in Rich County

Table IV-51: Rich County Landslide Areas	
Active Landslides (in Acres)	Historically Active Landslides 1847 to present (in Acres)
0	69,196

The steeper slopes of the Bear River Mountains on the west side of the county as they descend into the Bear Lake Valley have indications of historical landslide activity. Much of this area is where summer cabins are located.

Rich County Landslide Hazard Assessment Hazard Profile

Frequency	Infrequent
Severity	Moderate
Location	Mainly on Steeper slopes above Garden City in the Bear River Mountains.
Seasonal Pattern	Generally the worst in the wetter spring months.
Duration	Up to two weeks
Speed of Onset	No warning
Probability of Future Occurrences	Low

Assessing Vulnerability: Identifying Assets & Estimating Losses

Table IV-52: Rich County Landslide Risk Residential and Commercial (Active & Historically Active Landslides)					
Jurisdiction Name	Population	Residential Development at Risk		Commercial Development at Risk (x 1000)	
		Units	Value	Units	Income*/Structures**
Garden City	51	85	\$9,309,625	2	\$1,100/\$294
Unincorporated	13	54	5,924,444		
Population and Residential Development estimates are derived using 2000 Census data *2002 estimated total sales revenue (Census) ** Based on average 2002 assessed commercial building value for Cache County (2002 State Tax Commission Report & Cache County Assessor’s Office) Note: Communities not listed have no residential or commercial property identified in the hazard. Data does not include areas susceptible to debris flows (no data available)					

Table IV-53: Rich County Landslides Other Facilities at Risk (Active & Historically Active Landslides)				
Jurisdiction Name	Critical Facilities	Roads	Power lines	Rail Lines
Garden City		6.1miles/\$18,910,000		
Unincorporated		12.2miles/\$37,820,000	0.8miles/\$38,608	
See Appendix D for data sources and cost factors.				
Note: Jurisdictions not listed have no identified facilities at risk.				

Assessing Vulnerability: Analyzing Development Trends

More construction on the steeper slopes above Garden City and south of Garden City could be problematic.



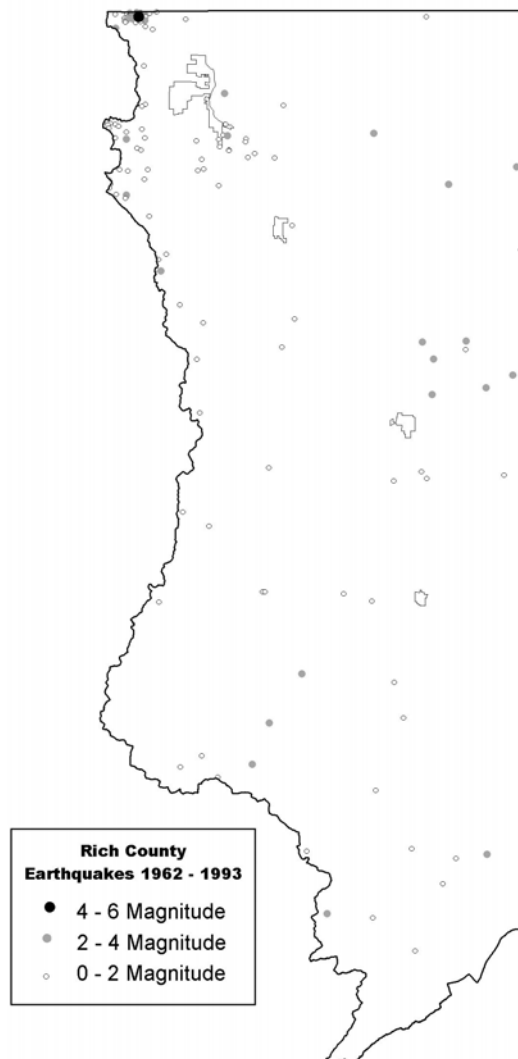
RICH COUNTY EARTHQUAKES

Background

Although not as seismically active as Box Elder and Cache Counties, Rich County does have recorded seismic activity. The predominate and most active faulting is the Bear Lake Fault on the east side of Bear Lake. **See the “Earthquake Fault Zone” Map in the county annex map section.**

History of Earthquakes in Rich County

On November 9, 1884 the Bear Lake Valley experienced an estimated 6.3 magnitude earthquake with the epicenter near Paris, Idaho followed by aftershocks of 2.3 magnitude. The earthquake was felt as far as Ogden.



Rich County Earthquake Hazard Assessment

Hazard Profile

Frequency	Occasional
Severity	Moderate
Location	Entire County with highest frequency in the Bear River Mountain Range. Surface fault ruptures are likely to occur in fault zones on the East Shore of Bear Lake.
Seasonal Pattern	None
Duration	A few minutes with potential aftershocks
Speed of Onset	No warning
Probability of Future Occurrences	Based on 1962-1993 data, there is a 10% chance every year of an earthquake of 3.0 magnitude or greater.

Kalliser indicates that the Bear Lake Fault is active with evidence of large earthquakes in the recent past. He reports a continuous line of scarplets in recent sediments on the east shore of the lake. In addition, the delta fans at the mouth of North and South Eden Canyons are displaced by faulting.

Some faulting has been reported by bathograms in the bottom of Bear Lake.

Assessing Vulnerability: Identifying Assets & Estimating Losses

The analysis did not document any impacts from liquefaction or fault zones to residential or commercial development in Rich County.

Table IV-54: Rich County Earthquakes (Fault Zone) Other Facilities at Risk				
Jurisdiction Name	Critical Facilities	Roads	Power lines	Rail Lines
Laketown		0.2miles/\$620,000		
Unincorporated		6.9miles/\$21,390,000	0.1/\$4,826	
See Appendix D for data sources and cost factors.				
Note: Jurisdictions not listed have no identified facilities at risk.				

Rich County HAZUS Analysis

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates can be used by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The results of the model ran for Rich County simulates a 2,500 year event with an earthquake magnitude of 7.0.

Table IV-55: Rich County Human Casualty Estimates (HAZUS Model 7.0 Magnitude Earthquake)					
Timing	Sector	Level 1	Level 2	Level 3	Level 4
2 A.M.	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	1	0	0	0
	Industrial	0	0	0	0
	Residential	5	1	0	0
	Single Family	6	1	0	1
	Total	12	2	0	1
2 P.M.	Commercial	4	1	0	0
	Commuting	0	0	0	0
	Educational	3	1	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Residential	1	0	0	0
	Single Family	1	0	0	1
	Total	10	2	0	1
5 P.M.	Commercial	5	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Residential	2	0	0	0
	Single Family	2	1	0	1
	Total	9	2	0	1
Severity Level 1: Injuries will require medical attention buy hospitalization is not needed. Severity Level 2: Injuries will require hospitalization buy are not considered life-threatening. Severity Level 3: Injuries will require hospitalization and can become life threatening in not promptly treated. Severity Level 4: Victims are killed by the earthquake.					

Table IV-56: Rich County Building-Related Economic Loss Estimates in \$ Millions (HAZUS Model 7.0 Magnitude Earthquake)							
Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses	Wage	0	.20	.27	.01	.01	.48
	Capital-Related	0	.08	.24	0	0	.34
	Rental	.90	.61	.16	0	0	1.66
	Relocation	.08	.02	.01	0	0	.11
	Subtotal	.98	.91	.68	.01	.01	2.59
Capital Stock Loses	Structural	4.38	1.57	.46	.06	.07	6.55
	Non-structural	15.38	5.93	1.08	.18	.11	22.69
	Content	3.83	1.07	.48	.10	.07	5.54

Table IV-56: Rich County Building-Related Economic Loss Estimates in \$ Millions (HAZUS Model 7.0 Magnitude Earthquake)							
Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
	Inventory	0	0	.02	.02	0	.04
	Subtotal	23.59	8.57	2.04	.36	.26	34.82
	Total	24.57	9.48		.37	.27	37.41

Table IV-57: Rich County Transportation System Loss Estimates in \$ Millions (HAZUS Model 7.0 Magnitude Earthquake)			
System	Component	Inventory Value	Economic Loss
Highway	Segments	398	0
	Bridges	5	0
	Subtotal	403	0
Railways	Segments	0	0
	Bridges	0	0
	Subtotal	0	0
Airport	Facilities	0	0
	Runways	0	0
	Subtotal	0	0
	Total	403	0

Table IV-58: Rich County Transportation System Loss Estimates in \$ Millions (HAZUS Model 7.0 Magnitude Earthquake)				
Classification	Total	Least Moderate Damage > 50%	Complete Damage > 50%	Functionality >50% at day 1
Hospitals	0	0	0	0
Schools	3	0	0	0
Police Stations	2	0	0	0
Fire Stations	3	0	0	0

Table IV-59: Rich County Expected Building Damage by Occupancy (HAZUS Model 7.0 Magnitude Earthquake)										
	None		Slight		Moderate		Extensive		Complete	
	Count	%	Count	%	Count	%	Count	%	Count	%
Agriculture	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	1	.10	1	.1	1	.2	0	.31
Education	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0
Residential	25	6.3	74	12	181	30	163	62	57	62
Single Family	385	93.7	539	87.9	410	69.9	98	37.8	36	38

Table IV-59: Rich County Expected Building Damage by Occupancy (HAZUS Model 7.0 Magnitude Earthquake)										
	None		Slight		Moderate		Extensive		Complete	
	Count	%	Count	%	Count	%	Count	%	Count	%
Total	410		614		592		261		93	

Assessing Vulnerability: Analyzing Development Trends

New lakeshore development on the east shore will be located near the Bear Lake Fault.



RICH COUNTY DAM FAILURE

Background

There are 525 regulated dams located in Rich County. Most of these dams are small detention ponds, small agricultural reservoirs or livestock watering facilities and most pose a minimal threat to human safety or property.

Of the 525 regulated dams 518 are designated as “low hazard” by the State of Utah Division of Water Rights. As defined by state statute, low hazard dams are those dams which, if they fail, would cause minimal threat to human life, and economic losses would be minor or limited to damage sustained by the owner of the structure.

A total of 5 dams have been designated as “moderate hazard” by the State of Utah in Rich County. Moderate Hazard dams which, if they fail, have a low probability of causing loss of human life, but would cause appreciable property damage, including damage to public utilities.

The State of Utah has rated 2 dams in Rich County as “high hazard” which means that, if they fail, have a high probability of causing loss of human life or extensive economic loss, including damage to critical public utilities.

Dam failure inundation maps and emergency action plans for each of the high risk dams can be found on the Utah Division of Water Right’s website at: <http://waterrights.utah.gov/cgi-bin/damview.exe?Startup>.

History of Dam Failure in Rich County

No significant dam failures have occurred in Rich County.

Rich County Dam Failure Hazard Assessment Hazard Profile

Frequency	Rare
Severity	Potentially Catastrophic
Location	Areas down stream of failed dam.
Seasonal Pattern	Anytime. Highest risk in spring during snowmelt.
Duration	A few hours
Speed of Onset	No warning
Probability of Future Occurrences	Low

Assessing Vulnerability: Identifying Assets & Estimating Losses

Woodruff Creek Dam

The Woodruff Creek Dam is a high hazard rating facility which lies nine miles east and upstream from the town of Woodruff. The inundation area follows Woodruff Creek covering the valley

bottom as it moves downhill. Once out of the canyon, the inundation area widens significantly, covering the entire town of Woodruff before ending at the Bear River.

Assessing Vulnerability: Analyzing Development Trends

Any new downstream development that is located in the floodplain increases the exposure to risk in terms of human life and property. Given the relatively low probability of catastrophic dam failures, most jurisdictions are unwilling to regulate development in dam failure inundation areas.